

Advances in Soft Computing

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Applied Soft Computing Techniques: The Challenge of Complexity

Applied Soft Computing
Techniques:
The Challenge of Complexity



This volume presents the proceedings of the 10th Online World Conference on Soft Computing in Industrial Applications (WSC10) together with related to the conference in the field of soft computing. The volume presents research, original papers and invited papers of leading researchers in the field of soft computing, including evolutionary computation, fuzzy logic, neural networks, and their hybrid and the applications in various real-world settings.

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ADVANCES IN SOFT COMPUTING

Ji-Hong Park · **Bernard de Baets**
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Editors

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Soft Computing
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Ajith Abraham · Bernard de Baets
Mario Köppen · Bertram Nickolay
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Advances in Soft Computing

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WSC9 – Honorary Chair’s Message

Hello and welcome to the 9th Online World Conference on Soft Computing in Industrial Applications (WSC9). This conference, brought to you from everywhere in the world at once, provides an opportunity for researchers and practitioners to meet in a virtual environment to present their latest results and to exchange ideas. With this conference we are taking advantage of the latest advances in hard computing to discuss the newest ideas in soft computing. There is no doubt that with this type of online conferences we are pioneering into the future. The ability to transport yourself anywhere in the world at the speed of light, in the comfort and safety of your own home or office, can’t be seen as anything but amazing. If there are participants from another galaxy, please let us know!!

Soft computing, a name introduced by LA. Zadeh, can be seen as a confluence of a number of related, complementary and supporting disciplines. Among the central components are neural networks, fuzzy logic and genetic algorithms. Rough sets, probabilistic reasoning and significant portions of artificial intelligence also come under the umbrella of soft computing. The field of computational intelligence is closely related. Central to the field of soft computing is an attempt to provide tools that can enable systems to attain a level of performance similar to human beings. Among other things, this requires an ability to represent and manipulate imprecise and granular information.

While the areas of potential applications of soft computing is virtually unbounded, I shall point out, with a high degree of bias, some areas in which I believe the possible applications of soft computing are particularly interesting. Clearly the Internet is one such area. As we move from the initial “Gee Whiz” phase to the next stage where success requires intelligent manipulation of knowledge and data, website architects must draw upon tools from soft computing. As a particular example, the development of intelligent agents for retrieving and searching for information will benefit from application of these technologies. Fuzzy logic will play an important role in the development of the semantic web. True customization and personalization of websites must take advantage of soft computing. The related area of data mining is already using many ideas from this field. Many people believe the coming century will see many benefits from recent discoveries in microbiology, genetics and proteomics. Here soft computing can help, especially in the development of algorithms needed for partial matching, clustering and pattern recognition.

I would like to thank the organizers of this conference, particularly the General Chair Ajith Abraham and the Program Chair Mario Köppen for their efforts in making this conference happen.

I now declare the 9th Online Conference on Soft Computing in Industrial Applications open. I look forward to a lively exchange of ideas.

Ronald R. Yager
New York, USA

WFSC Chairperson's Message

As the Chairperson of World Federation of Soft Computing (WFSC) it is my great pleasure to welcome all participants of the 9th On-line World Conference on Soft Computing in Industrial Applications (WSC9) in the Cyberspace. The conference is the ninth of WSC series sponsored by WFSC.

Since we started the cyber-conference in 1996, this series has been expanded and received wider support from the researchers in the field of soft computing. The conference has been recognised internationally IEEE SMC Society, NAFIPS, IFSA and EUSFLAT. The conferences have removed the financial burden from the authors and participants, and thus have attracted good quality papers from all over the world. The registered participants have also represented academia and industries from many countries around the world. The conferences have established a new way of publishing technical papers and discussing papers in greater detail. Every year we try to introduce innovation in the way we manage the conference. In future we are looking for feedback from our participants to improve the quality and branding of the conference.

The 'World Federation of Soft Computing (WFSC)', which is a virtual society of active researchers in the field, has been established since 1999. The aim of the Federation is to promote 'Soft Computing' across the world. WFSC also promotes other organisations interested in Soft Computing. The Federation also has an official Journal called 'Applied Soft Computing (ASOC)', published by Elsevier. Best Papers application papers from WSC9 will be invited to submit revised and extended versions to the ASOC Journal on a FAST TRACK basis. The papers will be published in Sciencedirect website soon after they are accepted, which enables authors to publish their work fast and readers get the latest work in Soft Computing on their desktop. A free hardcopy of the volume is provided to the authors by the end of the year.

I am looking forward to meet you all during the conference! Let's make an effort to start a good debate on Soft Computing research and its application.

Rajkumar Roy
Chair of World Federation of Soft Computing (WFSC)

WSC9 Chair's Welcome Message

On behalf of the 9th *Online Conference on Soft Computing in Industrial Applications* (WSC9) organizing committee, we wish to extend a very warm welcome to this exciting meeting. The conference program committee has organized an exciting and invigorating program comprising of presentations from distinguished experts in the field and important and wide-ranging contributions on state-of-the-art research that provide new insights into the '*Current Innovations in Soft Computing Applications*'. All registered participants had the opportunity to attend the various sessions (online papers, presentations and demonstrations) from September 20 to October 08, 2004. For online interaction, several discussion boards were also setup and moderated by the respective session chairs.

During the past few years, WSC conference has achieved steady growth as evident from the support received from the academia and industry. From the very beginning of WSC9, we have been receiving so much support from several institutions around the globe. Our special thanks go to New Mexico Technology, USA; Oxford University, UK; Ben-Gurion University, Israel; Beijing City University, China; University of South Australia, Australia and Fraunhofer-IPK Berlin, Germany for providing the resources to maintain the web sites of WSC9. WSC9 was hosted by the 'World Federation on Soft Computing' and is technically co-sponsored by IEEE Systems Man and Cybernetics Society, North American Fuzzy Information Processing Society, European Society for Fuzzy Logic and Technology, International Fuzzy Systems Association and Elsevier Science, The Netherlands. Technical submissions were invited in, but not limited to, any of the following areas:

- Fuzzy Control
- Neuro-Fuzzy Systems
- Genetic Fuzzy Systems
- Neuro-Fuzzy-Genetic Systems
- Software Agent Systems and Architectures
- Multi-Agent Architectures and Collaborative Learning
- Ant Colony Optimization
- Fuzzy Information Fusion
- Rough Sets
- Bayesian Networks
- Fuzzy Image Processing
- Bio-inspired Systems
- Artificial Neural Networks
- Support Vector Machines
- Evolutionary Algorithms, Simulated Annealing, Tabu Search
- Evolutionary Multiobjective Optimization
- Hybrid Optimization Techniques (integration of global search and local search techniques)

- Simulation Environments
- Data Mining
- Industrial Applications of Soft Computing
- Intelligent Information Retrieval
- Language Processing
- Robotics
- Autonomous Reasoning
- Fault Diagnosis
- Bioinformatics
- Web Intelligence
- Speech Processing
- Business Information Systems
- Knowledge Management

WSC9 received 6 technical session proposals and over 100 technical papers from 27 countries. These papers focused on a variety of soft computing applications spanning from information security, bioinformatics, manufacturing, scheduling, and so on. Each submission was peer reviewed by three or more program committee members. These accepted papers offer stimulating insights into emerging soft computing technologies and their applications. The papers are grouped into several technical sessions each with a specific application focus. Thanks to Katrin Franke (Fraunhofer IPK Berlin, Germany) for all the wonderful coordination work related to the organization of invited special sessions.

We would like to express our sincere thanks to all the authors and members of the program committee that has made this event a success. We are also grateful to Professors Ronald Yager and Witold Pedrycz for their valuable time in preparing the plenary lectures. Finally, we hope that you will find the presentations and discussions to be a valuable resource in your professional, research, and educational activities whether you are a student, academic, researcher, or a practicing professional. Enjoy!

Ajith Abraham
WSC9 – General Chair

Mario Köppen
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